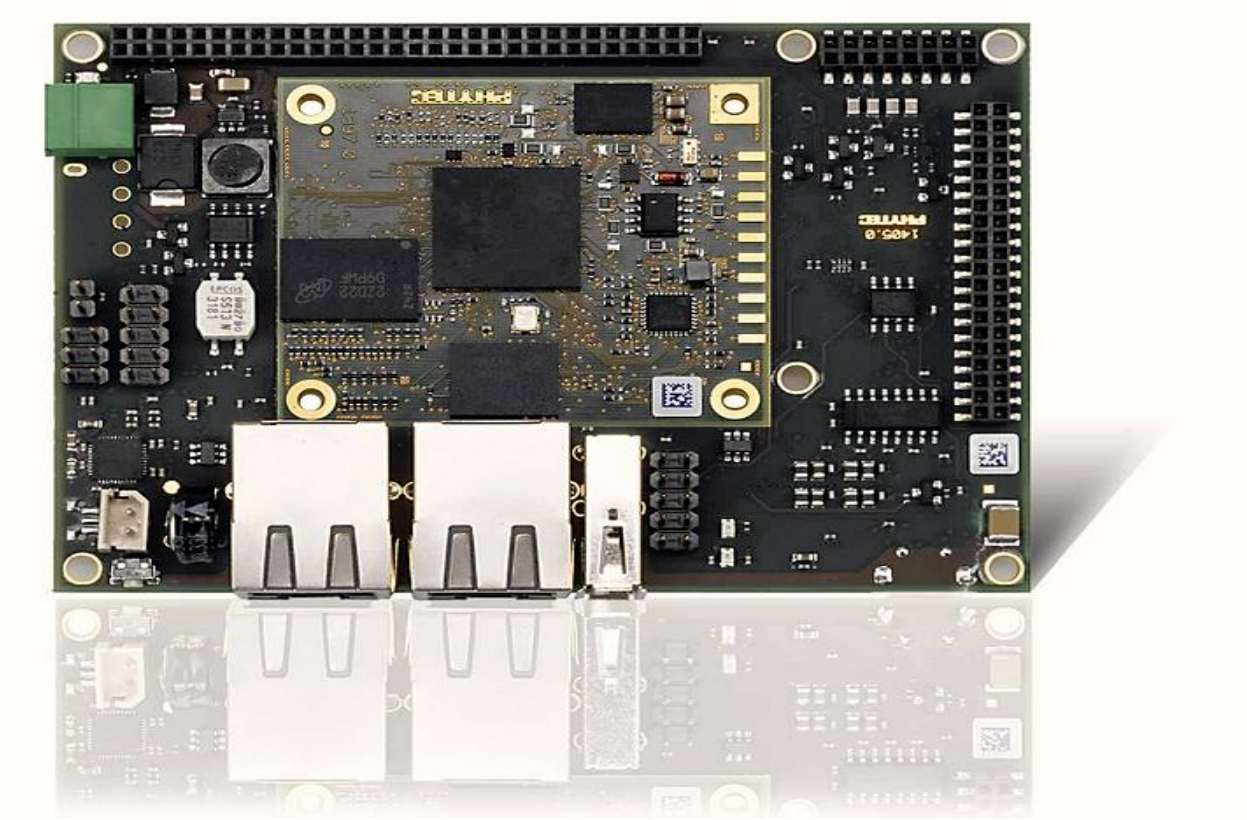
phyBOARD WEGA-AM335x
Single Board Computer - Hardware Manual



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SOM PCB No.	**:**	1397.0
CB PCB No.	**:**	1405.0
Edition	**:**	March, 2014

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Conventions, Abbreviations, and Acronyms

Conventions

The conventions used in this manual are as follows:

- Signals that are preceded by a "/" character are designated as active low signals. Their active state is when they are driven low, or are driving low;
  for Example: /RESET.

- Tables show the default setting or jumper position in bold, text.

- References made to the phyCORE-Connector always refer to the high density SAMTEC connectors on the underside of the phyBOARD-WEGA-AM335x System on Module.

Abbreviations and Acronyms

Many acronyms and abbreviations are used throughout this manual. Use the table below to navigate unfamiliar terms used in this document.

Table-1. Abbreviations and Acronyms Used in This Manual

Abbreviation	Definition
BSP	Board Support Package (Software delivered with the Development Kit including an operating system (Windows or Linux) preinstalled on the module and Development Tools).
CB	Carrier Board; used in reference to the 1404.0
DFF	D flip-flop
EMB	External memory bus
EMI	Electromagnetic Interference
GPI	General purpose input
GPIO	General purpose input and output
GPO	General purpose output
IRAM	Internal RAM; the internal static RAM on the TI AM335x processor
J	Solder jumper; these types of jumpers require solder equipment to remove and place
JP	Solder less jumper; these types of jumpers can be removed and placed by hand with no special tools
PCB	Printed circuit board
PDI	PHYTEC Display Interface; defined to connect PHYTEC display adapter boards or custom adapters
PEB	PHYTEC Extension Board
PMIC	Power Management Integrated Circuit
PoE	Power over Ethernet
PoP	Package on Package
RTC	Real-time clock
SMT	Surface mount technology

Table-2. Abbreviations and Acronyms Used in This Manual

Abbreviation	Definition
SOM	System on Module; used in reference to the PCL-051/WEGA Board System on Module
TRM	Technical Reference Manual
VBAT	SOM battery supply input

Different types of signals are brought out at the phyCORE-Connector. The following table lists the abbreviations used to specify the type of a signal.

Table-3. Types of Signals

Type of Signal	Description	Abbreviation
Power	Supply voltage	PWR
Ref-Voltage	Reference voltage	REF
USB-Power	USB voltage	USB
Input	Digital input	IN
Output	Digital output	OUT
Input with pull-up	Input with pull-up (jumper or open-collector output)	IPU
Input/output	Bidirectional input/output	IO
5V Input with pull-down	5V tolerant input with pull-down	5V_PD
LVDS	Differential line pairs 100 Ohm LVDS level	LVDS
Differential 90 Ohm	Differential line pairs 90 Ohm	DIFF90
Differential 100 Ohm	Differential line pairs 100 Ohm	DIFF100
Analog	Analog input or output	Analog

Preface

This phyBOARD-WEGA-AM335x Board Hardware Manual describes the System on Module's design and functions. Precise specifications for the TI AM335x processor can be found in the processor datasheet and/or user's manual.

In this hardware manual and in the schematics, active low signals are denoted by a "/" preceding the signal name, for example: /RD. A "0" represents logic-zero or low-level signal, while a "1" represents a logic one or high-level signal.

Declaration of Electro Magnetic Conformity of the phyBOARD-WEGA-AM335x

PHYTEC System on Modules (SOMs) are designed for installation in electrical appliances or, combined with the PHYTEC Carrier Board, can be used as dedicated Evaluation Boards (for use as a test and prototype platform for hardware/software development) in laboratory environments.

> **CAUTION:**
> PHYTEC products lacking protective enclosures are subject to damage by ESD and, hence, may only be unpacked, handled or operated in environments in which sufficient precautionary measures have been taken in respect to ESD-dangers. It is also necessary that only appropriately trained personnel (such as electricians, technicians and engineers) handle and/or operate these products. Moreover, PHYTEC products should not be operated without protection circuitry if connections to the product's pin header rows are longer than 3 mm.

PHYTEC products fulfil the norms of the European Union's Directive for Electro Magnetic Conformity only in accordance to the descriptions and rules of usage indicated in this hardware manual (particularly in respect to the pin header row connectors, power connector and serial interface to a host-PC).

> Implementation of PHYTEC products into target devices, as well as user modifications and extensions of PHYTEC products, is subject to renewed establishment of conformity to, and certification of, Electro Magnetic Directives. Users should ensure conformance following any modifications to the products as well as implementation of the products into target systems.

The phyBOARD-WEGA-AM335x Board is one of a series of PHYTEC System on Modules that can be populated with different controllers and, hence, offers various functions and configurations. PHYTEC supports a variety of 8/16 and 32-bit controllers in two ways:

1. As the basis for Rapid Development Kits which serve as a reference and Evaluation platform.
2. As insert-ready, fully functional phyCORE OEM modules, which can be Embedded directly into the user's peripheral hardware design.

Implementation of an OEM-able SOM subassembly as the "core" of your embedded design allows you to focus on hardware peripherals and firmware without expending resources to "re-invent" microcontroller circuitry. Furthermore, much of the value of the phyCORE module lies in its layout and test.

“Production-ready Board Support Packages (BSPs)” and Design Services for our hardware further reduce development time and expenses. Take advantage of PHYTEC products to shorten time-to-market, reduce development costs, and avoid substantial design issues and risks.

For more information refer to: http://www.phytec.in/services/hardware.html

Product Change Management

In addition to our HW and SW offerings, the buyer will receive a free obsolescence maintenance service for the HW provided when purchasing a PHYTEC SOM.

Our Product Change Management Team of developers is continuously processing all incoming PCN's (Product Change Notifications) from vendors and distributors concerning parts which are being used in our products. Possible impacts to the functionality of our products, due to changes of functionality or obsolesce of a certain part, are evaluated in order to take the right measures in purchasing or within our HW/SW design.

Our general philosophy here is: We never discontinue a product as long as there is demand for it. Therefore a set of methods has been established to fulfil our philosophy:

Avoidance strategies

- Avoid changes by evaluating longevity of a part during design-in phase.
- Ensure availability of equivalent second source parts.
- Maintain close contact with part vendors for awareness of roadmap strategies.

Change management in case of functional changes

- Avoid impacts on Product functionality by choosing equivalent replacement parts.
- Avoid impacts on Product functionality by compensating changes through HW redesign or backward compatibility

SW maintenance

- Provide early change notifications concerning functional relevant changes of our Products.

Change management in rare event of an obsolete and non replaceable part

- Ensure long term availability by stocking parts through last time buy management, according to product forecasts.
- Offer long term frame contract to customers.

We refrain from providing detailed, part-specific information within this manual, which is subject to changes, due to ongoing part maintenance for our products.

1. Introduction

1.1 Hardware Overview:

The WEGA Board for phyCORE-AM335x is a low-cost, feature-rich software development platform supporting the TI AM335x processor families. At the core of the phyBOARD-WEGA-AM335x is the PCL-051/phyCORE-AM335x System On Module (SOM) in a direct solder form factor, containing the AM335x processor, SDRAM, NAND Flash, power regulation, supervision, transceivers and other core functions required to support the phyBOARD-WEGA-AM335x. Surrounding the SOM is the PBA-CD-02/ phyBOARD-WEGA-AM335x Carrier, adding power input, buttons, connectors, signal breakout amongst other features.

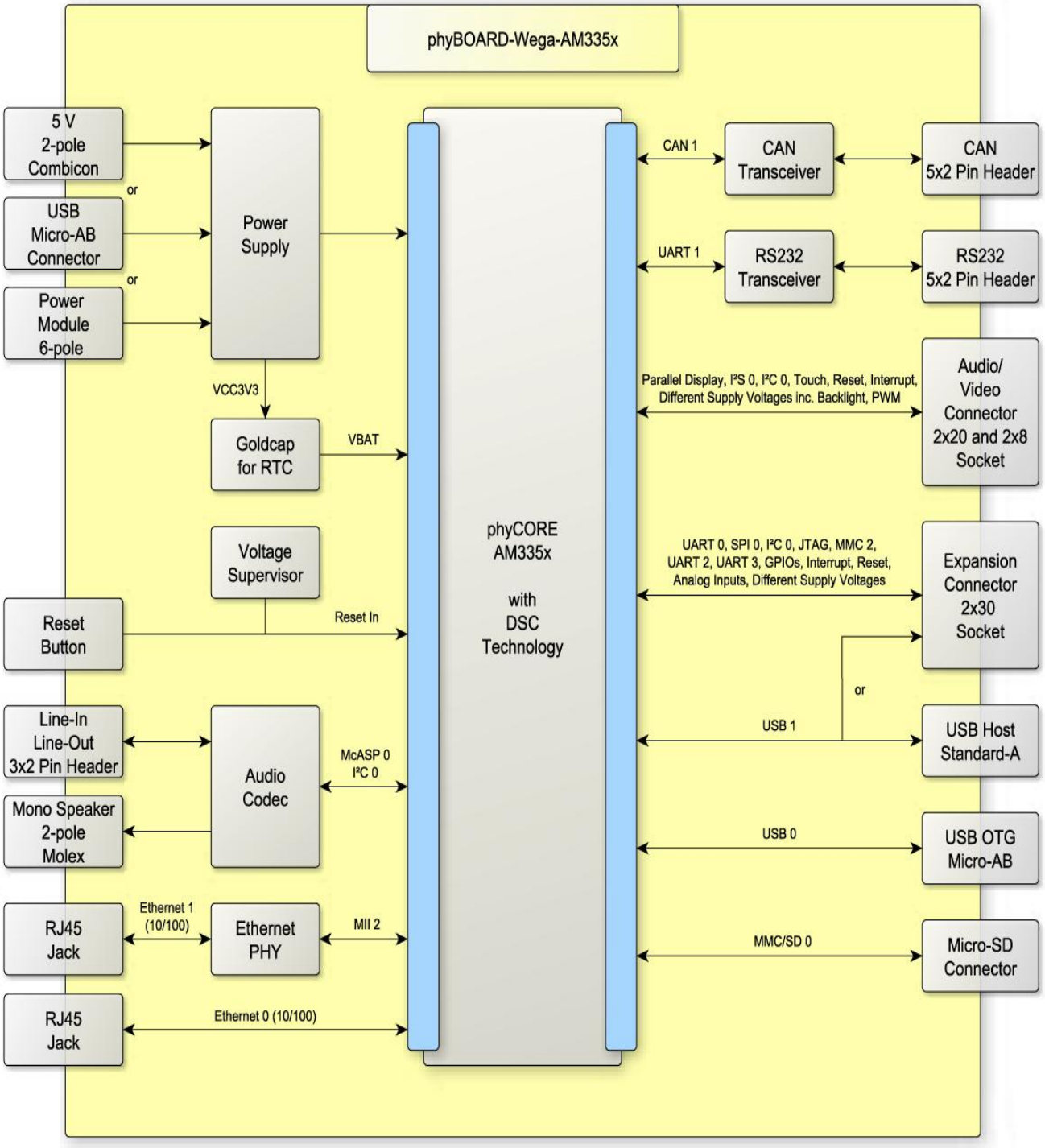
The PCL-051 System On Module is a connector-less, BGA style variant of the PCM-051/phyCORE-AM335x SOM. Unlike traditional PHYTEC SOM products that support high density connectors, the PCL-051 SOM is directly soldered down to its Carrier Board using PHYTEC's Direct Solder Connect technology. This solution offers an ultra-low cost Single Board Computer for the AM335x processor, while maintaining most of the advantages of the SOM concept.

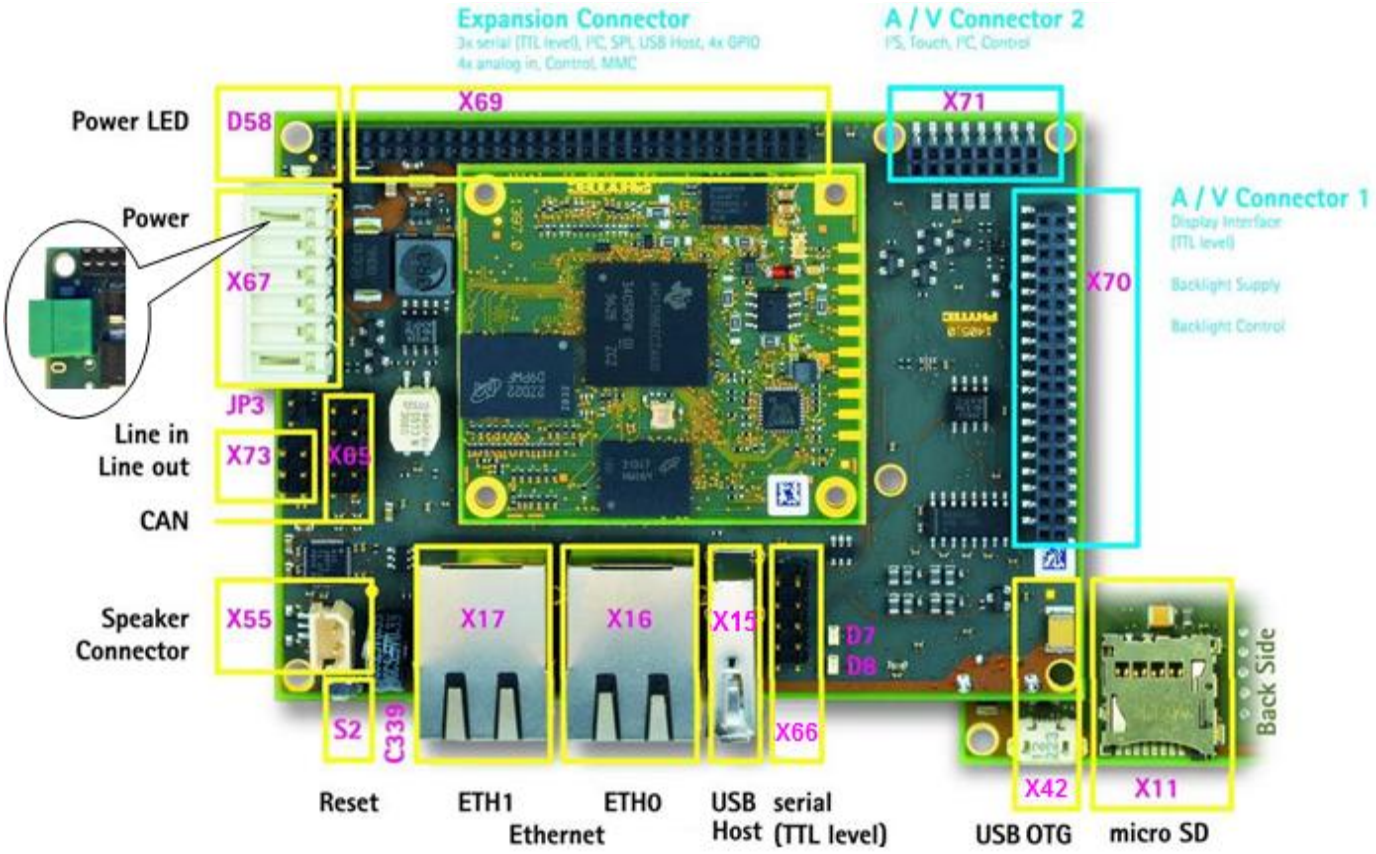
Adding the phyCORE-AM335x SOM into your own design is as simple as ordering the connectored version (PCM-051) and making use of our phyBOARD-WEGA-AM335x Carrier Board (PBA-CD-02), or RDK Carrier Board (PCM-953) reference schematics. A summary of the phyBOARD-WEGA-AM335x features, along with a block diagram are presented below.

1.2 Features of the phyBOARD-Wega-AM335x:

- The phyBOARD-Wega-AM335x supports the following features
- PHYTEC's phyCORE-AM335x SOM with Direct Solder Connect (DSC)
- Pico ITX standard dimensions (100mm×72mm) Boot from MMC or NAND Flash Max. 1 GHz core clock frequency.
- Three different power supply options (5V only with 3.5mm comb icon or micro USB connector, external power module e.g. 12V-24V input voltage).
- Two RJ45 jacks for 10/100 Mbps Ethernet
- One USB OTG interface available at an USB Micro-AB connector at the back side one secure Digital/Multi Media memory card interface brought out to a Micro-SD connector at the back side
- CAN interface at 5x2 pin header 2.54mm
- Audio codec with stereo Line in and Line out (3x2 pin header 2.54mm) and mono speaker (2-pole Molex)
- RS-232 transceiver supporting UART1 incl. Handshake signals with data rates of up to 1 Mbps (5x2 pin header 2.54mm)
- Reset – Button
- Audio/Video (A/V)connectors
- Expansion connector
- Backup battery supply for RTC with Gold cap (lasts approx. 17 ½ days)

phyBOARD Wega AM335x Block Diagram.




Expansion Connector
3x serial (TTL level), I²C, SPI, USB Host, 4x GPIO
4x analog in, Control, MMC
A / V Connector 2
I²S, Touch, I²C, Control
A / V Connector 1
Display Interface
(TTL level)
Backlight Supply
Backlight Control
Power LED
D58
X69
X71
Power
X67
X70
JP3
Line in
Line out
X73
X65
CAN
Speaker
Connector
X55
X17
X16
X15
D7
D8
S2
C339
X66
X42
X11
Back Side
Reset
ETH1
ETH0
Ethernet
USB
Host
serial
(TTL level)
USB OTG
micro SD

2. PCL-051/phyCORE-AM335x System on Module

This chapter gives a brief introduction to the PCL-051/phyCORE-AM335x System on Module (SOM), highlighting its benefits and features. For more detailed information, please refer to the Hardware Manual for the modular, connectored version of the SOM (PCM-051) by clicking here.

The phyCORE-AM335x belongs to PHYTEC's phyCORE System on Module (SOM) family. The phyCORE SOMs represent the continuous development of PHYTEC SOM technology. Like its mini-, micro-, and nano MODULE predecessors, the phyCORE boards integrate all core elements of a microcontroller system on a sub miniature board and are designed in a manner that ensures their easy expansion and embedding in peripheral hardware developments.

As independent research indicates that approximately 70% of all EMI (Electro Magnetic Interference) problems stem from insufficient supply voltage grounding of electronic components in high frequency environments, the phyCORE board design features an increased pin package. The increased pin package allows dedication of approximately 20% of all connector pins on the phyCORE boards to ground. This improves EMI and EMC characteristics and makes it easier to design complex applications meeting EMI and EMC guidelines using phyCORE boards even in high noise environments.

phyCORE boards achieve their small size through modern SMD technology and multi-layer design. In accordance with the complexity of the module, 0402-packaged SMD components and laser-drilled Microwave are used on the boards, providing phyCORE users with access to this cutting edge miniaturization technology for integration into their own design.

The PCM-051, connector version of the phyCORE-AM335x is a sub-miniature (44 mm x 50 mm) insert-ready SOM populated with AM335x processor. Its universal design enables its insertion into a wide range of embedded applications. All processor signals and ports extend from the processor to high-density pitch (0.5 mm) connectors aligning two sides of the board. This allows the SOM to be plugged like a "big chip" into a target application.

The PCL-051, connector less version of the phyCORE-AM335x populating the phyBOARD-WEGA-AM335x is identical to the connectored version, with the exception of the connection interface. Instead of two high density connectors aligning the edges of the board, the PCL-051 solders directly down to its Carrier Board with a BGA style footprint.

Precise specifications for the processor populating the board can be found in the applicable processor user's manual and datasheet. The descriptions in this manual are based on the AM335x processor. No description of compatible processor derivative functions is included; as such functions are not relevant for the basic functioning of the WEGA Board.

3. Accessing the phyBOARD-Wega Interfaces:

PHYTEC phyBOARD-Wega is fully equipped with all mechanical and electrical components necessary for the speedy and secure start-up and subsequent communication to and programming of applicable PHYTEC System on Module (SOM) modules. phyBOARD-Wega Boards are designed for evaluation, testing and prototyping of PHYTEC System on Module in laboratory environments prior to their use in customer designed applications.

3.1 Concept of the phyBOARD-Wega:

The phyBOARD-Wega provides a flexible development platform enabling quick and easy start-up and subsequent programming of its soldered phyCORE-AM335x System on Module. The carrier board design allows easy connection of additional extension boards featuring various functions that support fast and convenient prototyping and software evaluation. The carrier board is compatible with phyCORE-AM335x only.

This modular development platform concept includes the following components:

The phyCORE-AM335x module populated by default with the AM3354 processor and all applicable SOM circuitry such as DDR SDRAM, Flash, PHYs, and transceivers to name a few.

The phyBOARD-Wega which offers all essential components and connectors for start-up including: A power socket which enables connection to an external power adapter, interface connectors such as DB-9, USB and Ethernet allowing for use of the SOM's interfaces with standard cable.

The following sections contain specific information relevant to the operation of the phyCORE-AM335x mounted on the phyBOARD-Wega Carrier Board.

3.2 Overview of the phyBOARD-Wega Peripherals:

The phyBOARD-Wega is depicted in *above section*. It features many different interfaces and is equipped with the components as listed in *above section*. For a more detailed description of each peripheral refer to the appropriate chapter listed in the applicable highlights the location of each peripheral for easy identification.

3.3 Connectors and Pin Header:

This lists all available connectors on the phyBOARD-Wega.

Table-4: Connectors description

Reference Designator	Description
X11	Secure Digital / Multi Media Card (Micro-slot)
X15	USB Host connector (USB 2.0 Standard-A)
X16	Ethernet 0 connector (RJ45 with speed and link LED)
X17	Ethernet 1 connector (RJ45 with speed and link LED)
X42	USB On-The-Go connector (USB Micro-AB)
X55	Mono Speaker output (2-pole Molex)
X65	CAN connector (5×2 pin header)
X66	RS-232 with RTS and CTS (UART1 5×2 pin header)
X67	Power supply 5 V only (via 6-pole WAGO male header, or 2-pole PHOENIX base strip)
X69	Expansion connector (2×30 socket connector)
X70	A/V connector #1 (2×20 socket connector)
X71	A/V connector #2 (2×8 socket connector)
X72	Optional 5 V power supply via USB Micro-AB connector
X73	Stereo Line Out and Line In connector (2×3 pin header)

Note:

Ensure that all module connections are not to exceed their expressed maximum voltage or current. Maximum signal input values are indicated in the corresponding controller User's Manual/Data Sheets. As damage from improper connections varies according to use and application, it is the user‘s responsibility to take appropriate safety measures to ensure that the module connections are protected from overloading through connected peripherals.

4. LEDs:

The phyBOARD-Wega is populated with three LEDs to indicate the status of the USB VBUS voltages, as well as of the power supply voltage.

Shows the location of the LEDs. Their function is listed in the table below:

LED	Colour	Description
D7	green	Indicates presence of VBUS1 at the USB Host interface
D8	green	Indicates presence of VBUS0 at the USB OTG interface
D5	red	3.3 V voltage generation of the phyBOARD-Wega

5. Functional Components on the phyBOARD-WEGA Board:

This section describes the functional components of the phyBOARD-Wega. Each subsection details a particular connector/interface and associated jumpers for configuring that interface.

5.1 Power Supply Caution:

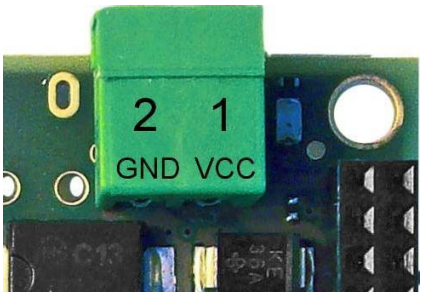
Do not change modules or jumper settings while the phyBOARD-Wega is supplied With power.

Power Connectors (X67 and X72)

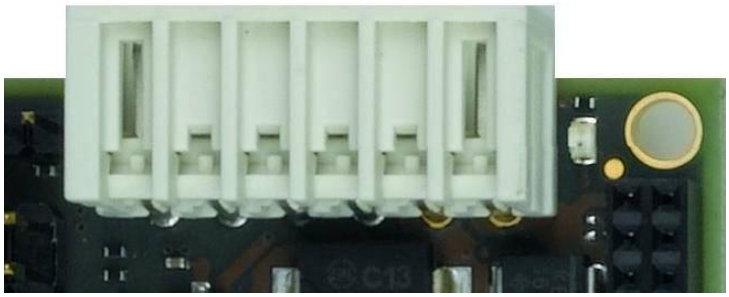
The phyBOARD-Wega is available with three different power supply connectors. Depending on your order you will find one of the following connectors on your SBC:

1. A 2-pole PHOENIX base strip 3.5 mm connector suitable for a single 5 V supply voltage, or
2. AN USB Micro-AB connector to connect a standard 5 V USB power supply, or
3. A 6-pole WAGO male header to attach the Power Module for phyBOARD-Wega (PEB-POW-01) which provides connectivity for 12 V – 24 V

The required current load capacity for all power supply solutions depends on the specific configuration of the phyCORE mounted on the phyBOARD-Wega the particular interfaces enabled while executing software as well as whether an optional expansion board is connected to the carrier board. A 5 V adapter with a minimum Supply of 1.5 A is recommended.



PHOENIX base strip



WAGO male header 6-pole

5.1.1 PHOENIX 2-pole Base Strip

The permissible input voltage is +5 V DC if your SBC is equipped with a 2-pole PHOENIX connector.

The following table show the pin assignment.

Pin	Signal	Description
1	VCC5V_IN	+5V power supply
2	GND	Ground

Pin Assignment of the 2-pole PHOENIX Connector atX67

5.1.2 USB Micro AB

If your board provides an USB Micro-AB female connector at the upper side of the board a standard USB Micro power supply with +5 V DC can be used to supply the phyBOARD-Wega.

Caution!

Do not confuse the USB Micro connector on the upper side of the board with the one on the back side of the board which provides USB OTG connectivity. The USB Micro connector on the upper side is exclusively used for power supply and has no other USB functionality!

5.1.3. WAGO 6-pole Male Header

If a WAGO 6-pole male header is mounted on your board, your board is prepared to connect to a phyBOARD-Wega Power Module (PEB-POW-01), or a custom power supply circuitry. The mating connector from WAGO has the EAN 4045454120610.

Pin	Signal	Description
1	VCC5V_IN	+5 V power supply
2	GND	Ground
3	VCC3V3_PMOD	+3.3 V power supply
4	VCC_BL	Backlight power supply
5	PMOD_PWRGOOD	Power good signal (connected to reset nRESET_IN)
6	PMOD_PWRFAIL	Power fail signal

Pin Assignment of the 6-pole WAGO Connector at X67

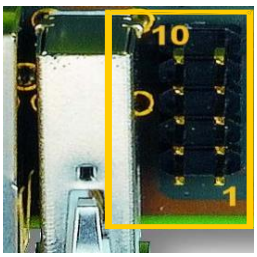
5.2 Power LED D58

The red LED D58 right next to the power connector indicates the presence of the 3.3 V supply voltage generated from the 5 V input voltage.

5.3 VBAT and RTC

On the phyBOARD-Wega the internal RTC of the AM335x is used for real-time or time-driven applications. To backup the RTC on the module, a gold cap (C339) is placed on the phyBOARD-Wega. This voltage source supplies the backup voltage domain VBAT of the AM335x which supplies the RTC and some critical registers when the primary system power, VCC5V_IN, is removed. The backup supply lasts approximately.

5.4 RS-232 Connectivity (X66)



RS-232 Interface Connector X66

Pin header connector X66 located next to the USB host connector provides the UART1 signals of the AM335x at RS-232 level. The serial interface is intended to be used as data terminal equipment (DTE) and allows for a 5-wire connection including the signals RTS and CTS for hardware flow control. Below table shows the signal mapping of the RS-232 level signals at connector X66.

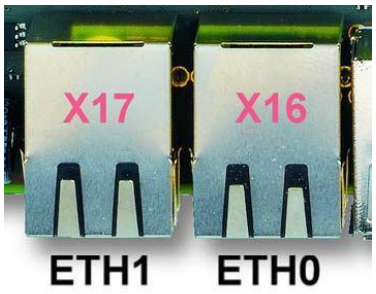
Pin	Signal	Pin	Signal
1	**NC**	2	**NC**
3	**UART1_RXD_RS232**	4	**UART1_RTS_RS232**
5	**UART1_TXD_RS232**	6	**UART1_CTS_RS232**
7	**NC**	8	**NC**
9	**GND**	10	**NC**

Pin Assignment of RS-232 Connector X66

An adapter cable is included in the phyBOARD-Wega-Am335x Kit to facilitate the use of the UART1 interface. The following figure shows the signal mapping of the adapter.

5.5 Ethernet Connectivity (X16 andX17)

The Ethernet interfaces of the phyBOARD-Wega are accessible at two RJ45 connectors (X16 and X17) on the board.



Ethernet Interfaces at Connectors X16 and X17

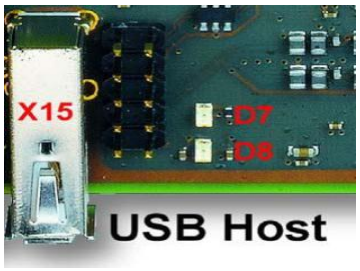
Both Ethernet interfaces are configured as 10/100Base-T networks. The LEDs for LINK (green) and SPEED (yellow) indication are integrated in the connector. Both LAN8710AI Ethernet transceivers support HP Auto-MDIX technology, eliminating the need for the consideration of a direct connect LAN cable, or a cross-over path cable. They detect the TX and RX pins of the connected device and automatically configure the PHY TX and RX pins accordingly.

5.6 USB Connectivity (X15 and X42)

The phyBOARD-Wega provides one USB Host and one USB OTG interface.

USB0 is accessible at connector X42 (USB Micro-AB) located at the back side of the phyBOARD-Wega. It is configured as USB OTG. USB OTG devices are capable to initiate a session, control the connection and exchange host and peripheral roles between each other. This interface is compliant with USB revision 2.0.

USB1 is accessible on the top at connector X15 (USB Standard-A) and is configured as USB Host.



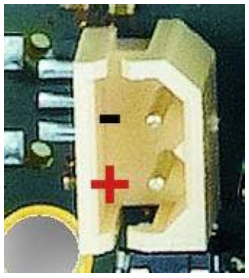
Components supporting the USB Interfaces

LED D8 displays the status of USB0_VBUS and LED D7 the status of USB1_VBUS. For later expansion boards the USB1 interface can be routed to the expansion connector (X69) by populating J72 and J73 (2+3).

5.7 Audio Interface (X55 andX73)

The audio interface provides a method of exploring AM335x's audio capabilities. The phyBOARD-Wega is populated with an audio codec at U35. The audio codec is connected to the AM335x's McASP0 interface to support stereo line input and stereo line output at connector X73. In addition to that the phyBOARD-Wega has one direct mono speaker output (2 × 1 W) at the Molex connector X55.

X55: Speaker



Audio Interfaces at Connectors X55 and X73

X73:LINE IN LINEOUT

Pin assignment at X73

Pin	Signal	Pin	Signal
1	**LINE_IN_L**	2	**LINE_IN_R**
3	**AGND**	4	**AGND**
5	**LINE_OUT_L**	6	**LINE_OUT_R**

Pin assignment at X55

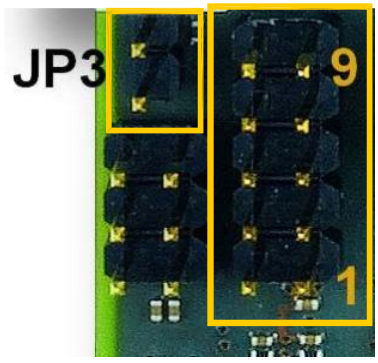
Pin	Signal	Description
1	**SPOP**	**Class-D positive differential output**
2	**SPOM**	**Class-D negative differential output**

For additional audio applications the McASP0 interface of the AM335x including the signals X_MCASP0_AHCLKX, X_I2S_CLK, X_I2S_FRM, X_I2S_ADC and X_I2S_DAC are routed to the A/V connector.

5.8 CAN Connectivity

The CAN1 interface of the phyBOARD-Wega-AM335x is accessible at connector X65 (2×5 2.54 mm pin header).

Jumper JP3 can be installed to add a 120 Ohm termination resistor across the CAN data lines if needed.



Components supporting the CAN Interface

Below table shows the signal mapping of the CAN1 signals at connector X65.

Pin	Signal	Pin	Signal
1	**NC**	2	**GND**
3	**X_CANL**	4	**X_CANH**
5	**GND**	6	**NC**
7	**NC**	8	**NC**
9	**Shield**	10	**NC**

Pin Assignment of CAN Connector X65

An adapter cable is included in the phyBOARD-Wega-Am335x Kit to facilitate the use of the CAN interface. The following figure shows the signal mapping of the adapter.

5.9 Secure Digital Memory Card/ Multimedia Card (X11)

SD / MM Card interface at connector X11

he phyBOARD-Wega provides a standard micro SDHC card slot at X11 for connection to SD/MMC interface cards. It allows easy and convenient connection to peripheral devices like SD- and MMC cards. Power to the SD interface is supplied by inserting the appropriate card into the SD/MMC connector, who features a card detection, a lock mechanism and a smooth extraction function by Push-in /-out of card.

"The AM335x processor on the phyBOARD-Wega can BOOT from this interface."

5.10 I2C Connectivity

The I2C interface of the AM335x is available at different connectors on the phyBOARD-Wega. The following table provides a list of the connectors and pins with I2C connectivity.

Connector	Location
Expansion connector X69	pin 11 (I2C_SDA); pin 13 (I2C_SCL)
A/V connector X71	pin 16 (I2C_SDA); pin 15 (I2C_SCL)

To avoid any conflicts when connecting external I2C devices to the phyBOARD-Wega the addresses of the on-board I2C devices must be considered.

5.11 System Reset Button (S2):

"The phyBOARD-Wega is equipped with a system reset button at S2. Pressing this button will toggle the X_nRESET_IN pin of the phyCORE SOM low, causing the module to reset. Additionally, a reset is generated on nRESET_OUT to reset peripherals."

System Reset Button S2

6. System Level Hardware Information

6.1 Audio/Video connectors (X70 & X71)

The Audio/Video (A/V) connectors X70 and 71 provide an easy way to add typical A/V functions and features to the phyBOARD-Wega. Standard interfaces such as parallel display, I²S and I²C as well as different supply voltages are available at the two A/V female dual entry connectors. Special feature of these connectors are their connectivity from the bottom or the top. The pin out of the A/V connectors is shown in *below tables.*

X70 Connector Details:

Pin No	Signal Name	Description	Pin(Ball-no)of Processor
1	GND	Ground	
2	X_LCD_D21	LCD D21	T11
3	X_LCD_D18	LCD D18	R12
4	X_LCD_D16	LCD D16	U13
5	X_LCD_D0	LCD D0	R1
6	GND	Ground	
7	X_LCD_D1	LCD D1	R2
8	X_LCD_D2	LCD D2	R3
9	X_LCD_D3	LCD D3	R4
10	X_LCD_D4	LCD D4	T1
11	GND	Ground	
12	X_LCD_D22	LCD D22	T10
13	X_LCD_D19	LCD D19	T12
14	X_LCD_D5	LCD D5	T2
15	X_LCD_D6	LCD D6	T3
16	GND	Ground	
17	X_LCD_D7	LCD D7	T4
18	X_LCD_D8	LCD D8	U1
19	X_LCD_D9	LCD D9	U2
20	X_LCD_D10	LCD D10	U3
21	GND	Ground	
22	X_LCD_D23	LCD D23	U10
23	X_LCD_D20	LCD D20	U12
24	X_LCD_D17	X_LCD_D17	V13
25	X_LCD_D11	LCD D11	U4
26	GND	Ground	
27	X_LCD_D12	LCD D12	V2
28	X_LCD_D13	LCD D13	V3
29	X_LCD_D14	LCD D14	V4
30	X_LCD_D15	LCD D15	T5

31	GND	Ground	
32	X_LCD_PCLK	LCD Pixel Clock	V5
33	X_LCD_BIAS_EN	LCD BIAS	R6
34	X_LCD_HSYNC	LCD Horizontal Synchronisation	R5
35	X_LCD_VSYNC	LCD Vertical Synchronisation	U5
36	GND	Ground	
37	GND	Ground	
38	X_PWM1_OUT	Pulse Wide Modulation	C15
39	VCC_BL	Backlight power supply	
40	VCC5V	5V powersupply	

X71 Connector Details:

Pin No	Signal Name	Description	Pin(Ball-no)of Processor
1	X_I2S_CLK	I²S Clock	A13
2	X_I2S_FRM	I²S Frame	B13
3	X_I2S_ADC	I²S Analog-Digital converter (microphone)	D12
4	X_I2S_DAC	I²S Digital-Analog converter (speaker)	D13
5	X_AV_INT_GPIO1_30	A/V interrupt; GPIO1_30	U9
6	X_MCASP0_AHCLKX	McASP0 high frequency clock	A14
7	GND	Ground	
8	nRESET_OUT	Reset	A10
9	TS_X+	Touch X+	B6
10	TS_X-	Touch X-	C7
11	TS_Y+	Touch Y+	B7
12	TS_Y-	Touch Y-	A7
13	VCC3V3	3.3 V power supply	
14	GND	Ground	
15	X_I2C0_SCL	I²C Clock	C16
16	X_I2C0_SDA	I²C Data	C17

7. Expansion connector:

The expansion connector X69 provides an easy way to add other functions and features to the phyBOARD-Wega. Standard interfaces such as UART, SPI and I2C as well as different supply voltages and some GPIOs are available at the expansion female connector. The pinout of the expansion connector is shown in Secure Digital Memory Card/ MultiMedia Card (X11).

Pin No	Signal Name	Description	Pin of Processor
1	VCC3V3	3.3 V power supply	
2	VCC5V	5 V power supply	
3	VDIG1_1P8V	1.8 V power supply	
4	GND	Ground	
5	X_SPI0_CS0	SPI 0 chip select 0	A16
6	X_SPI0_MOSI	SPI 0 master output/slave input	B17
7	X_SPI0_MISO	SPI 0 master input/slave output	B16
8	X_SPI0_CLK	SPI 0 clock output	A17
9	GND	Ground	
10	X_UART0_RXD	UART 0 receive data (standard debug interface)	E15
11	X_I2C0_SDA	I²C 0 Data	C17
12	X_UART0_TXD	UART 0 transmit data (standard debug interface)	E16
13	X_I2C0_SCL	I²C 0 Clock	C16
14	GND	Ground	
15	X_JTAG_TMS	JTAG Chain Test Mode Select signal	C11
16	X_nJTAG_TRST	JTAG Chain Test Reset	B10
17	X_JTAG_TDI	JTAG Chain Test Data Input	B11
18	X_JTAG_TDO	JTAG Chain Test Data Output	A11
19	GND	Ground	
20	X_JTAG_TCK	JTAG Chain Test Clock signal	A12
21	X_USB1_DP_EXP	USB1 data plus	R17
22	X_USB1_DM_EXP	USB1 data minus	R18
23	nRESET_OUT	Reset	A10
24	GND	Ground	
25	X_MMC2_CMD	MMC command	J16
26	X_MMC2_DAT0	MMC data 0	J17
27	X_MMC2_CLK	MMC clock	L15
28	X_MMC2_DAT1	MMC data 1	J18

29	GND	Ground	
30	X_MMC2_DAT2	MMC data 2	K15
31	X_UART2_RX_GPIO3_9	UART 2 receive data; GPIO3_19	A17
32	X_MMC2_DAT3	MMC data 3	H16
33	X_UART2_TX_GPIO3_10	UART 2 transmit data; GPIO3_10	B17
34	GND	Ground	
35	X_UART3_RX_GPIO2_18	UART 3 receive data; GPIO2_18	C15
36	X_UART3_TX_GPIO2_19	UART 3 transmit data; GPIO2_19	C18
37	X_INTR1_GPIO0_20	Interrupt 1; GPIO0_20	D14
38	X_GPIO0_7	GPIO0_7	C18
39	X_AM335_EXT_WAKEUP	External wakeup	C5
40	X_INT_RTCn	Interrupt from the RTC	
41	GND	Ground	
42	X_GPIO3_7	GPIO3_7; **Caution:** [Also connected to power-fail signal through R415!]	C14
43	nRESET_IN	Push-button reset	A10
44	X_GPIO3_8	GPIO 3_8; **Caution:** [Also connected to power-down circuit through R412!]	B14
45	X_AM335_NMIn	AM335x non-maskable interrupt	B18
46	GND	Ground	
47	X_AIN4	Analog input 4	C8
48	X_AIN5	Analog input 5	B8
49	X_AIN6	Analog input 6	A8
50	X_AIN7	Analog input 7	C9
51	GND	Ground	
52	X_USB1_DRVVBUS	USB 1 bus control output	F15
53	X_USB1_ID	USB 1 port identification	P17
54	USB1_VBUS	USB 1 bus voltage	T18
55	X_USB1_CE	USB 1 charger enable	P18
56	GND	Ground	
57	X_PMIC_POWER_EN	Enable Power Management IC for AM335x	
58 58	X_PB_POWER	Power On for Power Management IC for AM335x	

59	GND	Ground	
60	VCC5V_IN	5 V input supply voltage	

8. Technical Specifications

Table-5. Technical Specifications

Dimensions	100 x 72mm
Weight	64.2g / 2.26oz typ.
Storage Temperature	-40 °C to +125 °C
Operating Temperature	-40°C to + 85 °C (Industrial)
Humidity	95% r.F. not condensed
Operating Voltage	+5VDC +- 5%
Power Consumption	2.05W typ.; Linux booted from Micro SD card, running ping test

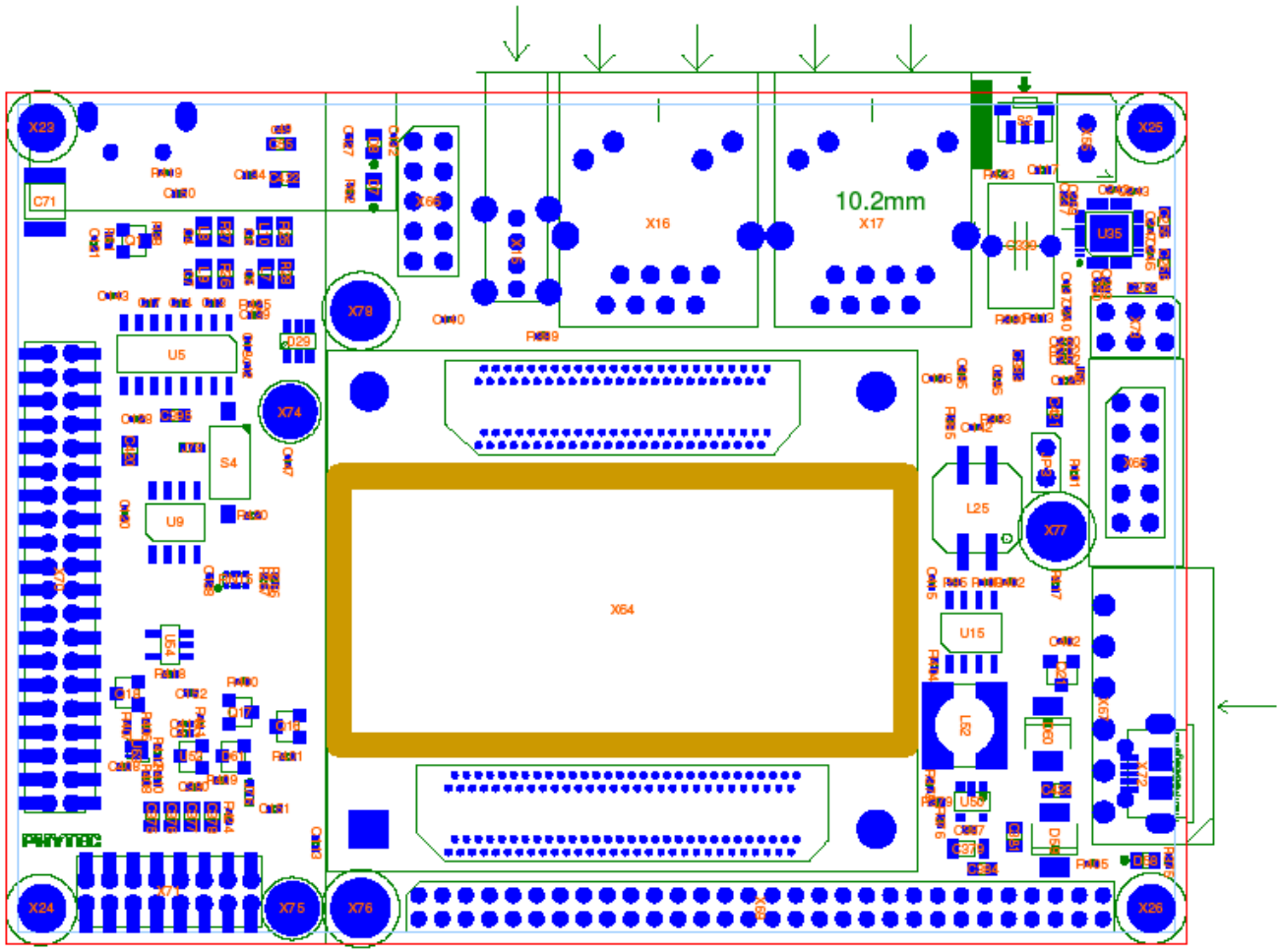
9. Revision History

Table-6 Revision History

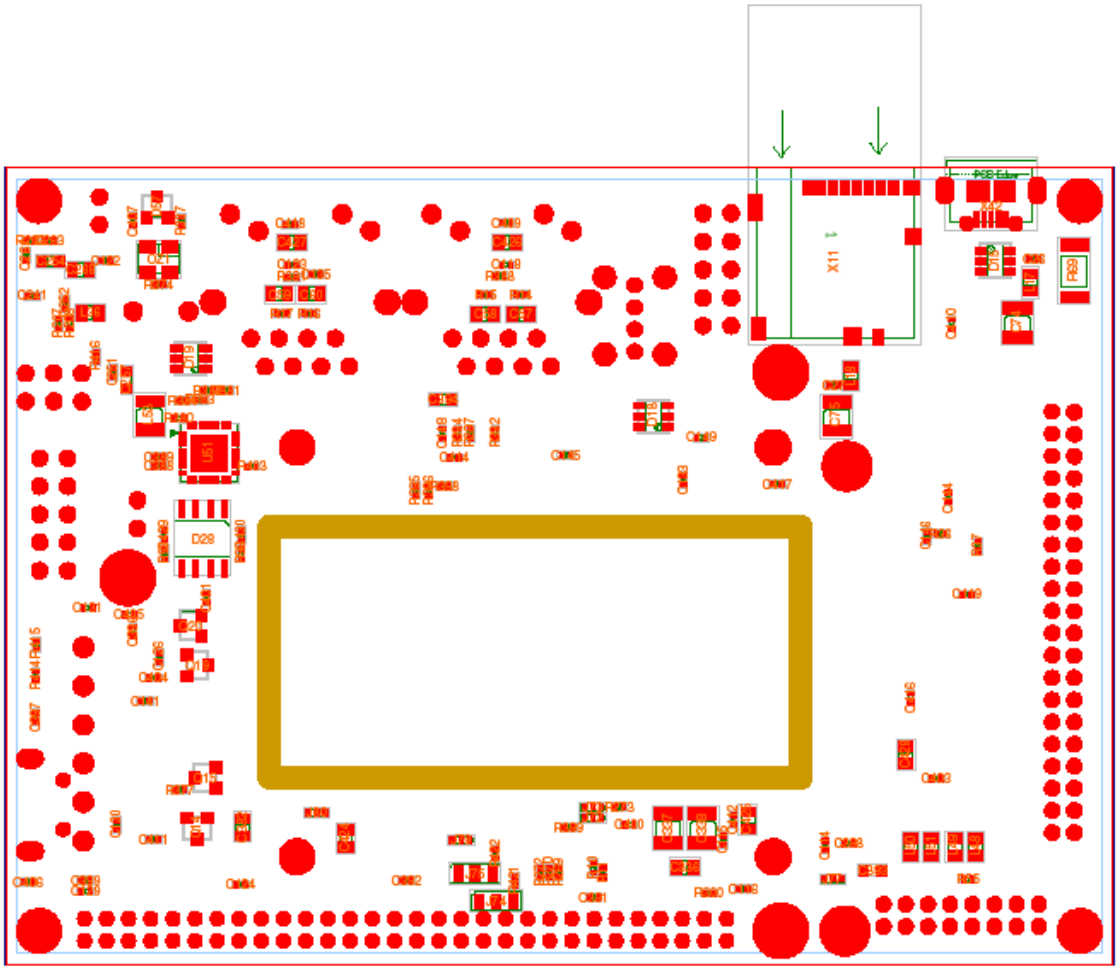
Date	Version Number	Changes in this Manual
08/11/2013	Hardware Manual PBA-CD-02	Preliminary documentation. Describes the phyBOARD-WEGA-AM335x With phyCORE-AM335x SOM.

10. PLACMENT DIAGRAMS

Figure 16. Placement Diagram of phyBOARD-WEGA-AM335x



Top Placement Diagram of phyBOARD-WEGA-AM335x



Bottom Placement Diagram of phyBOARD-WEGA-AM335x

Note:

If you want more information about mechanical dimensions please visit the this FTP link:

ftp://ftp.phytec.de/pub/Products/phyBOARD-WEGA-AM335x/Layout/PL1397_0/

PHYTEC

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